USER AND INSTALLATION MANUAL

ENGBO ANCHOR WINCH

MAXI 31
MAXI 32
MAXI 34-series
MAXI 38
MAXI 40

Engbo MAXI products fit most boat models

CE 0470

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ENGBO AS – *et selskap i Engbo-gruppen*

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E-MAIL: support@engbo.no **WEB:** www.engbo.no **TLF:** +47 33 00 31 50 **FAKS:** +47 33 00 31 60

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Introduction

Thank you for buying an Engbo anchor windlass. We hope you will find it useful and simple to work with. To ensure that you do, it is essential that you fit and use it in accordance with the instructions in this manual to ensure the best possible conditions for optimal windlass operation. For example, the windlass motor must receive sufficient power, and the windlass, rope and anchor bracket must all be positioned correctly.

Engbo has been active in the boat industry for more than 30 years, and are well aware of the requirements made on the equipment on board. To meet the challenges posed by a boat operating in wet conditions – often with limited power capacity – Engbo has invested heavily in developing **new, modern electronic control systems**.

Most Engbo MAXI windlasses can be supplied for use with rope or chain. The descriptions for rope or chain operation in this manual are therefore suitable for both.

IMPORTANT! This manual contains information you need to know before installing the windlass. Therefore, please read it carefully.

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General procedures for using Engbo Maxi windlasses

Read the operating manual carefully before installing and using the windlass.

Please note that strong forces are involved, so please use the windlass carefully and make sure, for example, that:

- You do not get your fingers caught up in the rope, chain, anchor, rollers or gypsies.
- The rope/chain is always under observation when the anchor is being raised.
- Everyone on board has been informed of how the windlass functions.
- You always operate the winch from a place that provides an unobstructed view of the anchor while it is being raised. This will help prevent "unpleasant surprises" that may damage the boat.
- You release the switch for a little while if the windlass is straining to raise the anchor. When the boat has started moving backwards, you can start the windlass again. This will make it easier for the windlass to operate, and it will use less power.
- If the anchor is stuck on the seabed: Release some rope and make it fast to a cleat on the boat. Then use the boat engine to free the anchor. Once the anchor has been freed, use the windlass in the usual manner.
- The windlass can run for max. 3 minutes at normal load.
- The anchor must **always be secured** to the boat while the boat is travelling. Use the securing lines supplied.
- Disconnect the power to the windlass once the boat is underway.
- Children must not operate the windlass.
- Negligent use can result in unnecessary damage.
- Always make sure the battery is well charged when using the windlass. **Always** have the motor running when the windlass is in use.
- The windlass features electronic overload protection. If necessary, let the winch cool down for 15–20 min. and then try again. In the event of an emergency, you can override the overload protection by disconnecting and then reconnecting the main power switch for the windlass.
- Engbo AS accepts no liability for injuries or damage resulting from the use of the windlass.

IMPORTANT!

- ***Always have the boat engine running while the windlass is in use.***
- ***Always disconnect the power from the windlass when it is not in use.***
- ***Make sure to fit and use the windlass and its accessories in such a way as to prevent injuries to people and damage to the boat and/or its surroundings.***
- ***Installation must be done or checked by trained personel with special knowledge regarding high current and low voltage.***
- ***Faulty installations or connections of any components to the windlass will render all warranty given by Engbo void.***
- ***To avoid overload when anchoring, the anchor line/chain must be secured properly.***
- ***If the anchor has got stuck at the seabed, if possible, pull the anchor from different directions by moving the boat in different positions.***
  When doing this, it is recommended to fix the anchor line in the cleat to avoid overload.

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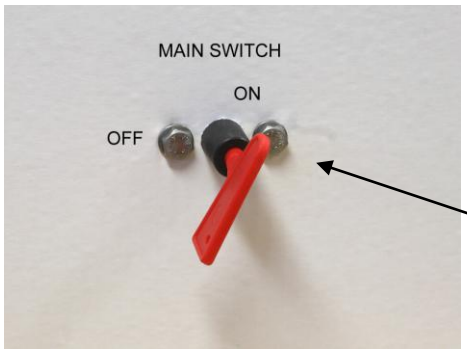
Operating instructions



Preparation before anchoring.

Landing.

- Make sure the boat engine is running during anchoring.
- Decide where you want to drop anchor.
- Check that the safety line on the anchor has been loosened.
- Turn on the main switch of the windlass.
- When the main switch of the anchor windlass has been switched off, you **must** press the down button first. Keep this button depressed for at least 1 second to drop the anchor.
- The windlass motor will run out for 1.5 seconds to ensure the correct release function.

Fixed switch panel

- Press the down button for at least 1 sec.
- The anchor will drop.
- The windlass is now released and the rope will run out in step with the progress of the boat towards land.
- Tie up the boat on land.

***NB** If you are using a free-fall chain windlass, the high weight of the chain may result in the full length of the chain being pulled out. If so, make sure to take up the slack once you have tied the boat up.*

- Tighten up the slack of the anchor rope (or chain) by pressing the up button so that the anchor settles firmly on the seabed and pulls the boat away from land.

***NB** The windlass will always wind in slowly for 1.5 sec before it switches to full speed. If you release the button within 1.5 sec and press it again and then repeat the process, the windlass will continue to wind in at low speed.*

Setting off

- Start the boat engine to charge the battery.
- Check that the main switch of the windlass is turned on.
- Cast off from land.
- Activate the windlass.

Keep the up button depressed, and the windlass will pull the boat away from land. The windlass will pull the anchor up at full speed until the first **auto stop** is activated.

***NB** This **ONLY** applies for rope windlasses and requires the anchor rope to be correctly fitted with brass wire markers.*

***NB** Keep an eye on the anchor when it leaves the water and seats in the anchor bracket. This will allow you to stop the windlass and prevent damage if the anchor pulls up foreign objects from the seabed.*

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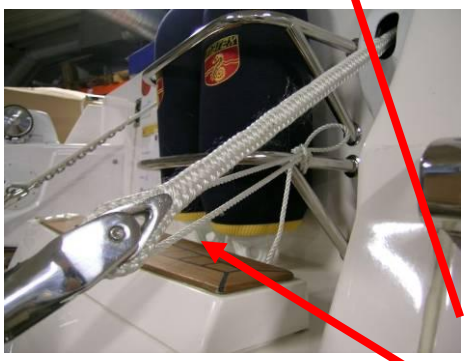

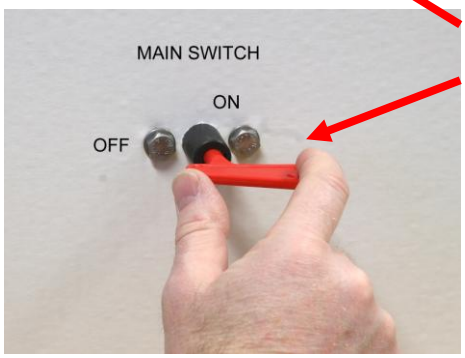

NB *If the windlass is straining while raising the anchor, it would be a good idea (and save power) to run the windlass in periods. Once the boat has begun to move backwards, you can release the up button and then run the windlass in periods.*

- Release the up button, press again and keep depressed.
- The windlass will continue to raise the anchor slowly until the second auto stop is activated, stopping the windlass completely.
- **The anchor** will then be correctly seated in the anchor bracket.
- **Attach the safety line** to the anchor.
- **Turn off** the main switch of the windlass.
- Have pleasant sailing!

Wireless remote control

- To switch on the remote control, keep one of the buttons depressed for 1.5 sec. The green "power" indicator will light up, and you will hear a brief audio signal.
- Every time you subsequently press a button, the associated indicator will light up, and the remote will emit an audio signal.
- To ensure a long lifetime, the remote control switches off automatically 5 min. after the last button was pressed. Automatic shut-off is preceded by two short audio signals and the "Power" indicator flashing.

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Anchor down

- When the remote control is switched **on**, you can drop the anchor by pressing the "down" button **in**. Keep this button depressed for at least 1 second to drop the anchor.
- The windlass will then run out for 1.5 seconds to ensure the correct release function.

Anchor up

- When the anchor has dropped to the seabed, press the "up" button to take up the slack. The windlass will continue to winch in as long as you keep the "up" button depressed. If the remote control has switched off automatically (i.e. if you have not pressed a button for more than 5 min) it will first switch on and then immediately start to wind in the anchor rope/chain. The windlass always starts to operate for 1.5 sec at reduced speed before increasing to full speed.
- This means that you can keep the windlass operating at low speed by releasing and pressing the "up" button repeatedly as required.

The "Power" indicator information:

- **Green light** indicates that the remote control is ready for use.
- **Orange light** indicates that the power supply to the windlass is not optimal, or that the windlass is overloaded and needs time to cool down.
- **Red light** indicates a system error or that the battery charge is too low for the windlass to operate.
- **Red light flashing slowly** accompanied by short audio signals indicates that contact with the electronic unit (receiver) cannot be established.

NB These error notifications will continue for as long as a button is depressed.

Forced operation of the windlass

If you need to raise the anchor a little further than the second "auto stop" mark, you can do so by keeping the "up" button depressed for more than 10 seconds. The windlass will then operate at low speed for as long as you hold the button in.
NB. The use of this function must be closely controlled to prevent damage.

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A brief description of the Engbo anchor system

Engbo MAXI windlasses is a common designation for 1000/1500 W, 12/24V Engbo windlasses. Some of the models are most suitable for fitting aft, some fore, and others both fore and aft. Engbo MAXI windlasses are designed for boats larger than around 25 feet. These windlasses – with the exception of type 33 – are **authentic free-fall** windlasses, which means that a neutral position in the windlass gears allows the anchor to drop directly to the seabed immediately after the "anchor down" (arrow down) button has been pressed.

The system is based on allowing the weight of the anchor on the outside of the anchor bracket to define how quickly the anchor drops. Therefore, it is important to avoid unnecessary friction between rope and hull, rollers and/or guides.
Example: If you fit the windlass with a Bruce anchor, you will need to use the jointed anchor bracket and ensure that the angle between horizontal and the rope is at least 15–20º. If the angle is too narrow, the anchor will "balance" and need "assistance" to tip out.

Electronic control unit

Engbo MAXI windlasses are fitted with **modern electronics** that consist of:
Transistor-controlled power electronics that replace the conventional cut-in relay. The new electronic unit contains no open contacts and is very flexible as regards voltage.
The **control electronics** are software-based and feature an **integrated radio receiver** that communicates with the **wireless remote control**, and a built-in system to protect the windlass motor and electronic components. Other functions controlled electronically are two "up" speeds and two automatic stop indicators for seating the anchor.

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Switch panels

12-79000

Standard touch panel

- The windlasses are supplied as standard with 1 x watertight (IP 68) touch panel (12-79000) for installing in a readily accessible place in the cockpit.
- If only this touch panel is to be fitted, it must, for safety reasons, be positioned so as to allow the operator a clear view of the anchor as it is raised and seated in the anchor bracket.
- The panel comes with a self-adhesive surface, but if you prefer, it can be seated more firmly using the screws supplied.

12-47020

12-47021

12-47022

Wireless remote control

- Three different wireless controls are available; 12-47020 designed for controlling two separate anchor winches, 12-47021 two winches and two thrusters and 12-47022 for controlling up to six different anchor/mooring winches.
- The remote control is splash proof and features a modern, compact design with strips of "anti-slip material" on the rear surface. It will also float if dropped over board.
- Two-way narrow-band radio communication guarantees the transmission of unique code to ensure that the signal controls only your windlass.
- An indicator light shows the voltage level or overload.
- Range of more than 30 m in normal conditions.
- The remote control uses three standard AAA (LR03) batteries – included. For normal operation, the batteries have a service life of more than two seasons.
- A wrist/neck strap is supplied as standard.

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Holder for wireless remote control

The enclosed, handy holder (12-47030), keeps the wireless remote located in the right place when not in use.

The holder kit consists of two single parts, and the holder to and the bracket.

- Slide the holder into the bracket by the slots.

- Fix the bracket to the base with the adhesive tape.

- By turning the backside of the remote forward and fit it in the holder, the buttons will be protected from unwanted activating of the winch or thruster when kept in the pocket.

Installation – general

The windlass should be positioned as high as possible to allow maximum space for the rope that will be stored below the windlass. The height from the bottom of the well where the rope is stored to the bottom edge of the line wheel should be **at least 50 cm**, and the **area should be at least 40 x 40 cm** to allow room for 50 m x 15 mm anchor rope. This will prevent the rope from bunching under the windlass, and assure sufficient friction between the line wheel and the rope.

See the specific descriptions for the separate windlass models.

The anchor bracket

Fit the windlass so that the rope is wound up in line with the anchor bracket (see pictures 1 and 2) – numerous different models are available – positioned on the exterior of the boat. The anchor bracket functions as a guide for the rope when the anchor is on the seabed and as a "seating point" for the anchor once it has been raised.

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Picture 1

Picture 2

Hull conduit / Line guide

It will often be necessary to install a hull conduit with a pulley that guides the rope with low friction through the hull.
The hull conduit will also prevent large volumes of water from leaking in. (When fitting the MAXI 34V or MAXI 40 on the inside of the stern, it will often be possible to adjust the hull conduit so as to prevent friction between the hull and the rope.)

Anchor rope

Engbo supplies original woven anchor rope with a lead core in the whole length of the rope along with a fine special thimble that will not snag on the pulley or bracket when the anchor is dropped. This rope has been specially designed for Engbo anchor windlasses and is a precondition for problem-free operation of the system. Supplied in various lengths and dimensions. The Engbo Maxi range generally uses 16 mm line. If the available space for storing the line is limited, 14mm line could be an alternative.

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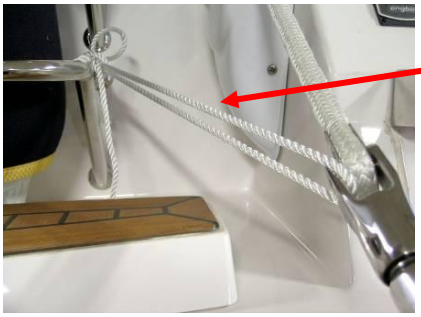
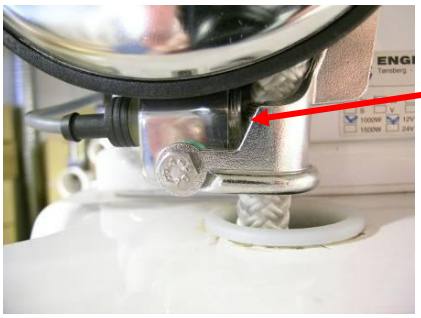


Safety line

Once the anchor is seated in the anchor bracket, it must be secured with the safety line supplied. This prevents the anchor from dropping unintentionally.



Auto stop

Engbo MAXI winches for anchor lines feature an advanced electronic auto stop switch that stops the windlass automatically, twice. The first stop comes just before the anchor reaches the anchor bracket. The windlass can then only be operated at low speed until it stops for the second time once the anchor is seated correctly in its bracket – ready to be dropped next time.

NB The fitting procedures for the different models are described in separate chapters.

Wireless remote

Fitting antenna

- Before starting to operate the wireless remote, the electronic unit must be fitted with an aerial. In addition, the remote control and electronic unit must be coded/ electronically instructed to communicate with one another.
- Remove the left-hand rubber plug on the electronic unit (the one closest to the Engbo logo).
- Pierce the plug (to one side) with the aerial.
- Depress the female socket of the aerial holder and press the aerial fully into the clip.
- Release the female socket and the aerial will be secured in position.
- Replace the rubber plug. Start by pressing the part of the rubber plug through which the aerial has been inserted, and continue around the edge until the plug is firmly seated.
- Make sure not to twist the plug and deform the aerial.

***NB** The remote control will function at short distances even if the aerial is not fitted.*

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Coding of the wireless remote control

Image A

Image B

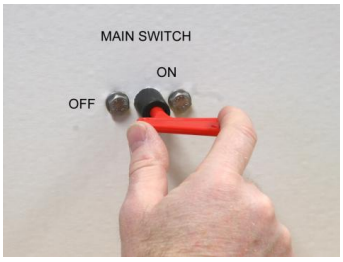

Image C

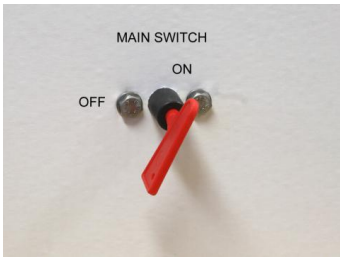

Image D

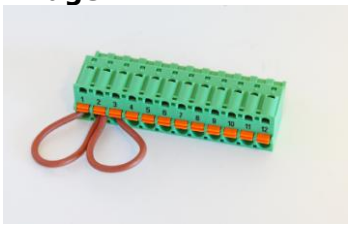

Image E

Procedure for wireless remote controls with serial no. above 8600

Important!

If your wireless control has serial no. lower than 8600, use the procedure enclosed your remote.

If coding a wireless control with serial no. above 8600 is to be coded to a receiver with Soft Ware of previous version be aware that the remote will be ready for operation after 10 sec.

How to put the wireless control unit in code mode:

- Select the pair of switches on the remote control to be coded.
- Press down both switches simultaneously for approximately 12 seconds. When you hear a short sound signal and the green power light starts to flash, **the remote control** is prepared for coding and will stay in coding mode for 5 minutes or until the coding has been finished.
  (Image A)

How to put the receiver unit in code mode:

Alt. 1. Touch panel installed.

- Press and keep both switches on the touch panel down while simultaneously switching on the power to the receiver unit.(Image B and C)
- The receiver will now understand that coding is requested and automatically connect to your wireless control and the wireless remote control will immediately be ready for use.
- This will be confirmed by a short sound signal and the green power light will turn from flashing to permanent.
- Check that the wireless control is functioning.

Alt. 2. Joystick installed.

- Turn the thruster main switch **off**.
- Disconnect the cables to the joystick connected to 1, 2 and 3 on the green plug on the remote control unit (RCU).
- Prepare two short wires (5 cm). Remove the insulation in both ends and connect these between 1 and 2 as well as between 2 and 3 on the green plug. (Image D).
- Turn the power **on**.
- The receiver will now understand that coding is requested and automatically connect to your wireless control and will immediately be ready for use.
- This will be confirmed by a short sound signal and the green power light will turn from flashing to permanent.
- Turn the thruster main switch **off**.
- Disconnect the short wires and connect the joystick cables.
- Turn the power on and check that the wireless control is functioning.

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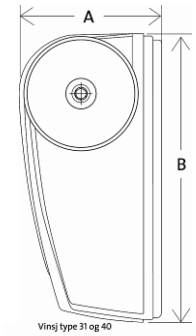
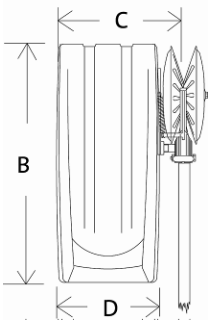
Dimensional sketches

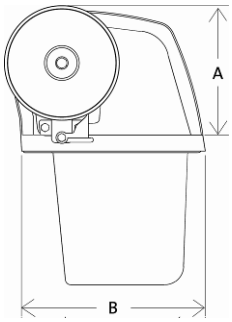
Maxi 31/40 – series



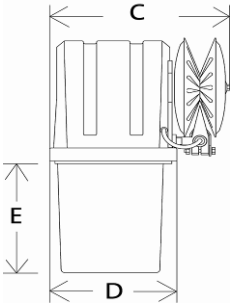


A: Height	200 mm
B: Length	370 mm
C: Width incl. line wheel	230 mm
D: Width excl. line wheel	160 mm

Maxi 32 – series



32 Vinsj



A: Height above deck	200 mm
B: Length above deck	255 mm
C: Width above deck, incl. line wheel	230 mm
D: Width excl. line wheel	160 mm
E: Height below deck	150 mm

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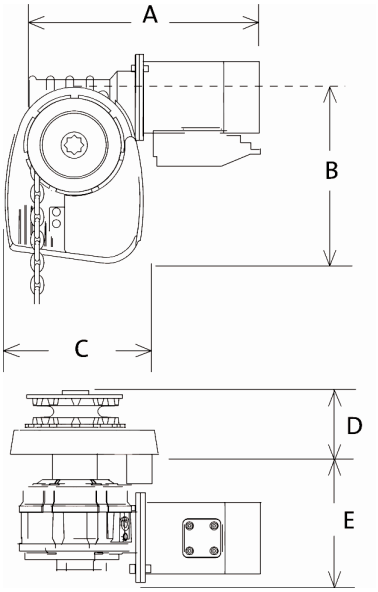
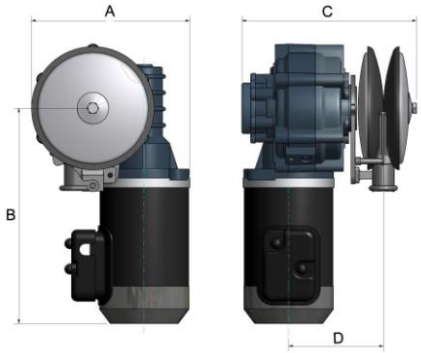
Maxi 33 – series



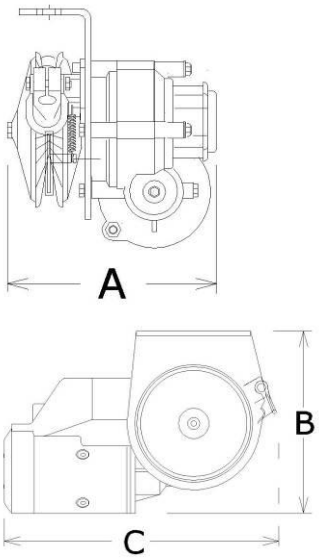
A: Total width below deck	350 mm
B: Total length above deck (cover)	220 mm
C: Total width above deck (cover)	160 mm
D: Height above deck	90 mm
E: Height below deck	160 mm

Maxi 34-series



A:	200 mm
B:	271 mm
C:	220 mm
D:	120 mm

Maxi 38-series



A: Total width	220 mm
B: Total height	230 mm
D: Total length	370 mm

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Technical specifications	ENGBO MAXI 31, 32, 33, 34, 38 and 40
Motor output, nom.	-12V DC / 1000 W -24V DC / 1500 W
Rope (for rope windlasses)	Woven lead rope: dia. 16 mm. Breaking strain: 4000 kg Woven lead rope: dia. 14 mm. Breaking strain: 3300 kg Length: 50 m, weight, 21.7 kg 75 m, weight, 32.0 kg 100 m, weight, 43.0 kg
Chain (for chain windlasses)	6.5 mm, short link Norwegian std. Breaking strain: 2300 kg 8 mm DIN 766 std. Breaking strain: 4000 kg
Pulling power (Electronically governed)	Rope windlasses: 1000 W, up to approx. 500 kg 1500 W, up to approx. 650 kg Chain windlasses: up to approx. 850 kg
Pulling speed	20–25 m/min with a load of approx. 40 kg
Power consumption	80–200 A during normal operation
Recommended fuses	1000 W/12V and 1500 W/24V, 250 A
Recommended min. battery capacity	12V/100Ah 24V/75 Ah
Weight: windlass with motor and cables	Approx. 20 kg
Weight: electronic unit	2.3 kg
Auto stop function	Yes *(NB Only for rope windlasses)*
Recommended anchor/ weight	Engbo / Bruce / Spade /10–30 kg
Recommended boat size	Over 25-foot
Fitting	See the separate descriptions for the individual models
Standard equipment	Windlass incl. cables for electronic module, electronic module, switch panel and main power switch
Supplementary equipment	Anchor (Multiple types) Anchor bracket (Multiple types) Battery cable Lead rope or chain Fuse w/holder Hull conduit for rope or chain Wireless remote control

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Electrical wiring

The label on the cover of the electronic unit also shows a diagram for connecting the electrical cables, - but always verify correct connections with wiring diagram.

IMPORTANT
*Always switch off the power at the **main switch** and/or **disconnect the battery** before working on the wiring connections.*

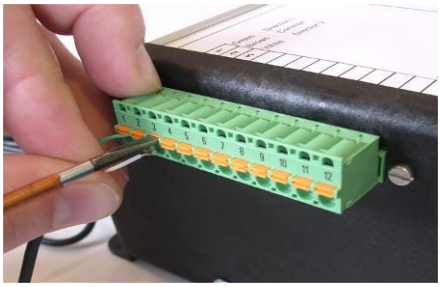
Switch panel

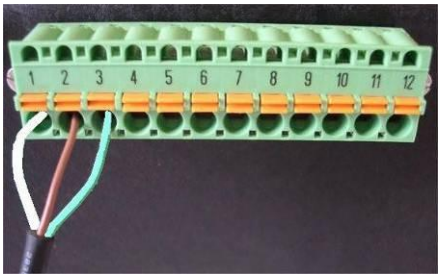
Standard touch panel (Item no. 12-79000)

The windlasses are supplied as standard with 1 x watertight touch panel for installing in a readily accessible place in the cockpit.
If only this touch panel is to be fitted, it must, for safety reasons, be positioned so as to allow the operator a clear view of the anchor as it is raised and seated in the anchor bracket.

The panel comes with a self-adhesive surface, but if you prefer, you can use the corner holes to screw it firmly in position.

- Drill an hole (dia. 18 mm) in the place where the panel is to be fitted.
- Run the panel cable through the hole.
- Remove the protection tape from the rear surface of the panel and affix the panel firmly to the surface.
- Run the cable to the electronic control box.
- Cut off any surplus cable and strip the ends of the three wires that are to be connected to the terminal clips as described in the connection diagram. (Picture of control box).





Connecting the switch panel

The windlasses are supplied as standard with one switch panel and 10 m of cable. Cut the wires to the required length and strip approx. 10 mm from their ends. Twist the wires in the separate cables and attach the cables to the green terminal box by pressing in the orange button above the appropriate hole and keeping it depressed while you insert the cable. Release the button once the cable is in place. Check that the cable is seated firmly and that the insulation is inside the terminal clip so that no loose wires are sticking out.
Connect the cables as follows:
1: White
2: Brown
3: Green
If you wish to connect additional panels, connect the cables in parallel to 1, 2 and 3. (2 is the common 0 V).

(Spring-lock terminal clips have been chosen rather than screw clips to prevent problems linked to vibrations and/or changes in temperature causing the clips to loosen).

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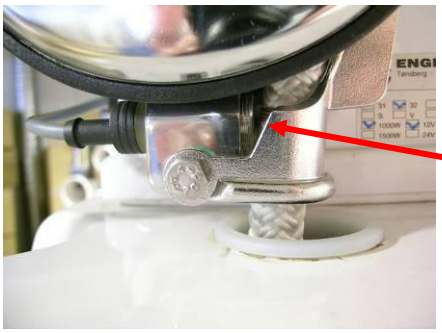
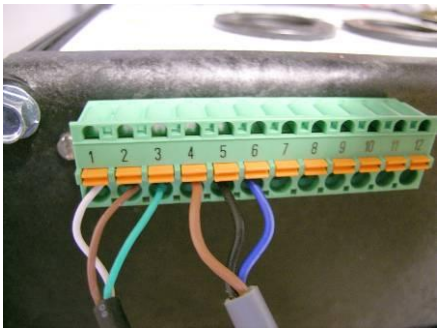


Connecting the auto stop switch

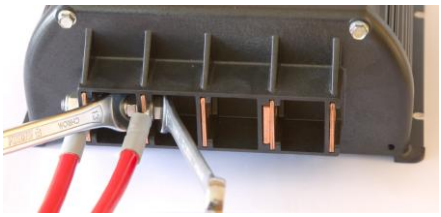
NB *Only applies to rope windlasses.*

Auto stop switch



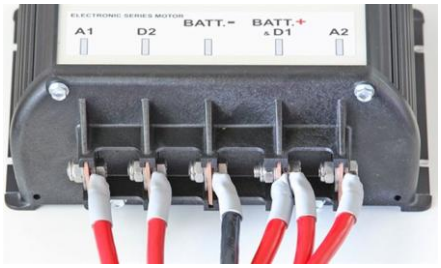
Connect the cables from the auto stop switch in the same way as described above.

Connect the cables as follows:
4: Brown (BN) = +V
5: Black (BK) = Signal
6: Blue (BU) = Gnd

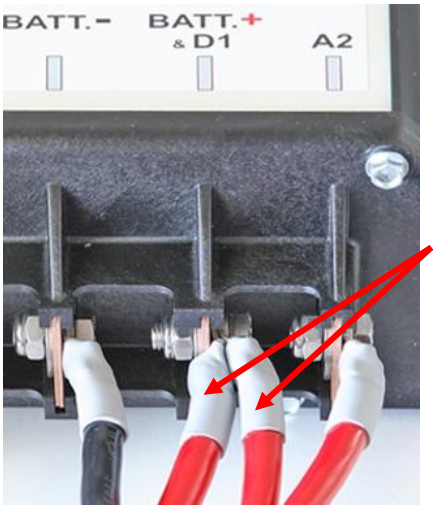


Connecting the motor and battery cables

It is best to connect the cables from the battery and motor to the electronic unit first, before fastening the unit upright against the bulkhead with the cables bent down over it.



Start by connecting the motor cable marked **(A1)** to the left. *NB The lock nuts are on the left-hand side.*
Then connect motor cable **(D2)** and then the black **(-)** battery cable. Then connect the red **(+)** battery cable to **(D1)** from the motor. Finally, connect **(A2)** from the motor. (If necessary, remove in the reverse order). It is best to use a pair of pliers, as shown in the picture.
The picture shows the correct connection and the direction of the bolts and cables.



NB *The cable shoes must be connected directly to the copper bars without washers or anything else between. Use flat washers between the bolt heads and the top sides of the cable shoes, and between the plastic side of the end panel and the locking nuts.*

The M8 x 25 mm bolt is for the positive battery cable. Please note that **on this terminal, there are two cable shoes** that have to be connected.

NB Connect the cable shoes as shown in the picture to ensure best possible contact.

NB *When the cable length (one way) between the battery and electronic unit is up to 5 m, use 35 mm^2 cable. For longer distances, use 50 mm^2 cable.*

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IMPORTANT

- The anchor winch **shall not** be installed in areas which may contain flammable or explosive gasses.
- In cases where this is not possible, the winch can be built into closed space, but with ventilation to open air.
- The MCU must be installed in dry place in such in a way that no cables with current may be short circuited.

Battery connection

WARNING!

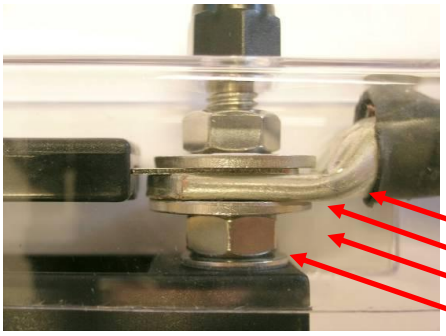
- Check that none of the cables is short-circuited or damaged before connecting the battery.
- Check that all power cables and connection points are tightly secured – post-tighten if necessary.
- NEVER use washers between cable shoes and connection points in places where high voltage currents pass.
- A fuse and main power switch must be fitted to the positive battery cable, as close to the battery as possible. (See the connection diagram).
- The windlass must always be connected to the start battery.
- Remember to turn off the main power switch when the windlass is not in use.

Main power switch

The picture shows the battery cable correctly connected to the main power switch, with rubber caps insulating the connection points.

Fuse and fuse holder

The fuse holder and fuse are to be fitted to the (+) cable between the battery and the electronic control unit of the windlass. See the electrical connection diagram.



This picture shows correct connection of the battery cable to the fuse-holder terminal.
NB The fuse must be fitted directly above the cable shoe. There must NOT be any washers or nuts between them.
Fit washers on both sides. Recommended torque: 13–15 NM. Fit plastic caps on the top of the cover.

- Washer
- Fuse
- Cable shoe
- Washer

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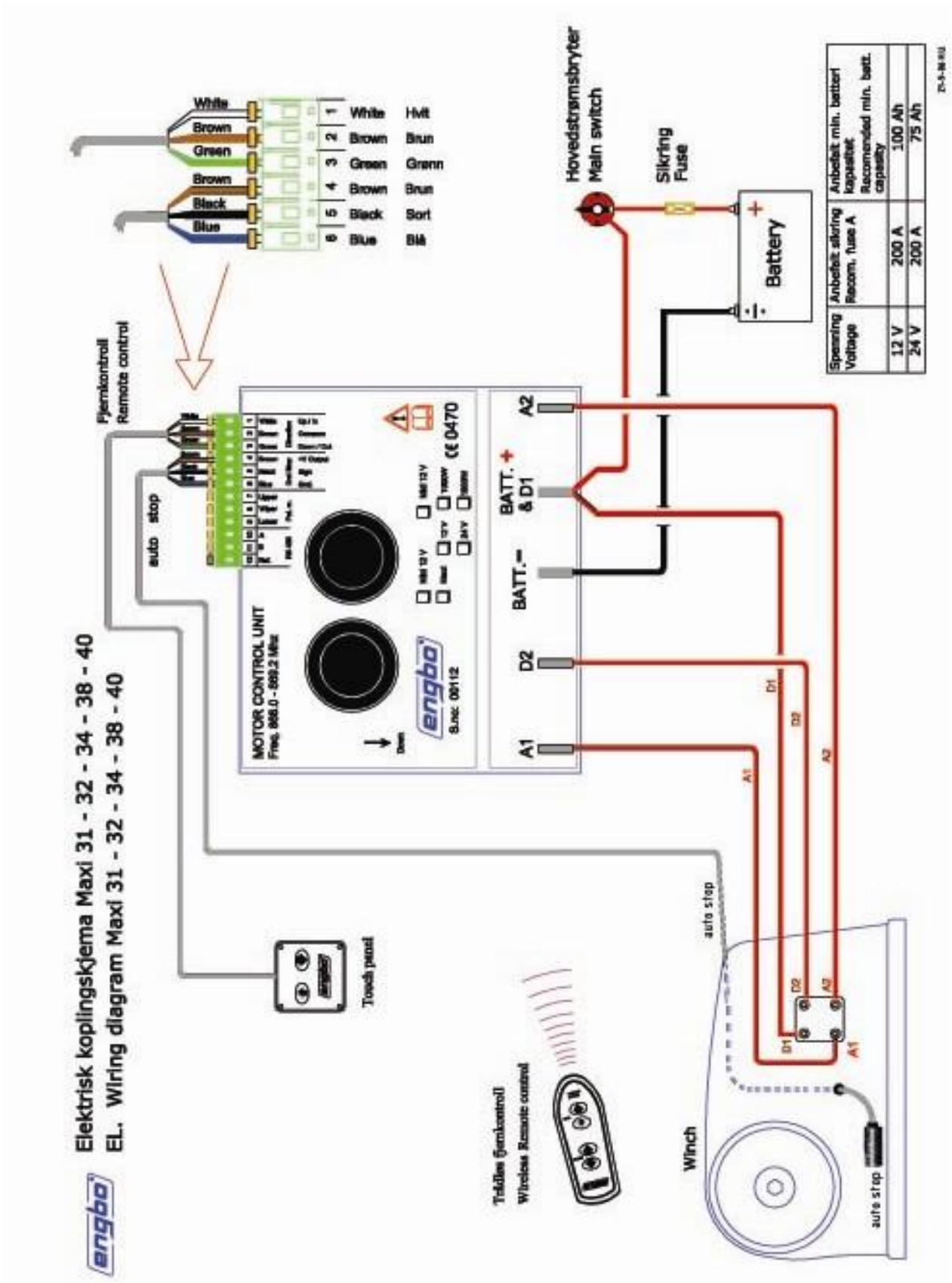
Electrical wiring diagram



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Fitting instructions

General information

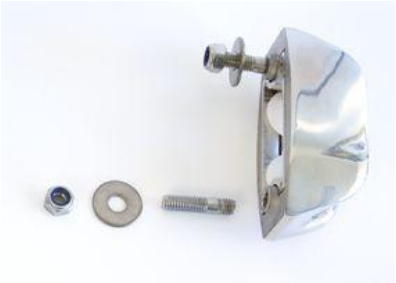
Position the windlass as high as possible so that there is plenty of space for the rope under it. The bottom edge of the line wheel should be at least 50 cm above the surface on which the rope (or chain) is to lie. This will leave room for 50 m of 16 mm woven Robline anchor rope or approx. 30 m of chain.
If the height is less than 50 cm, check that the rope (or chain) does not bunch up against the underside of the windlass. If this is the case, use a shorter rope (or chain).
We recommend side position of the windlass. Avoid any conflict between the anchor and the side wave that turns in directly behind the boat.

NB *Remember to secure the rope to the boat beneath the windlass at the point where the rope runs out.*

Hinged platform roller

Fit the anchor bracket with the pulleys beyond the edge of the platform so that the anchor/rope clears the platform when the anchor is raised.

Line guide in the stern



Check that the opening in the hull for the rope is correct in relation to the direction of the rope. To prevent unnecessary wear, the rope should not touch the edge of the opening either vertically or horizontally. The opening must be oval (from top to bottom) to accommodate the play in the rope roller when the windlass is used.

Art. nr. 68-00008

Line guide

If it is difficult to lead the rope directly from the line wheel to the anchor roller, it is a good idea to use a hull conduit with pulleys, for instance 68-00008 or the simple 39-79000 to lead the rope through the hull.

The hull conduit may be installed with studs as shown in picture.

Art. nr. 39-73000

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The anchor bracket

Standard platform roller, hinged platform roller, tilt bracket or anchor davit?

NB *If the windlass is fitted low in relation to the bathing platform – such that the angle between the bathing platform and the rope is small – and if you are using a Bruce anchor, you should use an Engbo hinged platform roller.*

Examples of different anchor brackets. See the Engbo catalogue for more akternatives.

Standard platform roller, long

Hinged platform roller

Tilt bracket

Anchor davit

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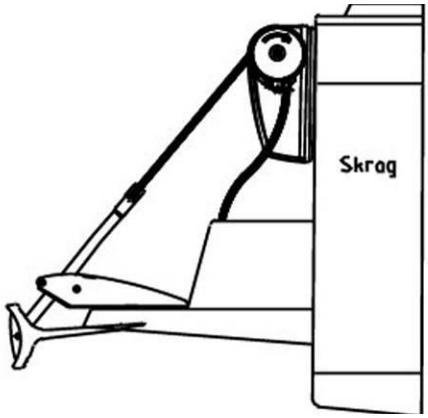
Fitting Maxi 31



The Maxi 31 is designed for fitting outside on the stern or inside on the stern side of a vertical bulkhead. The Maxi 31 has the line wheel on the right-hand side of the windlass, seen from behind.

NB *Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch)*

- Position the windlass as high as possible on the stern. Draw around the windlass. Use the enclosed drilling template to mark the screw holes on the supporting surface. Use bolts to attach the windlass. If necessary, reinforce the inside of the hull with a panel.
- If the surface on which the windlass is to be fitted is not even so that the entire windlass rests against the hull/supporting surface, the surface must be evened out using an intermediate layer to prevent damage to the hull and/or the windlass when the fixing bolts are tightened.
- Drill a hole for the cables and run these through the hull. Use Sikaflex or similar to seal the hole for the cables.
- Run the rope via the line wheel on the windlass, down through the rope/chain guide and under the line wheel. Use the windlass to wind it up.

NB *We recommend using an adapted container made of plastic or other weather-resistant material beneath the windlass to ensure that the rope is gathered up efficiently.*

Fitting Maxi 32

Maxi 32 for line

Maxi 32 for chain

The Maxi 32 is designed for fitting outside on a rope box or outside/inside on a horizontal surface. The Maxi 32 has the line wheel on the right-hand side of the windlass, seen from behind.

NB *Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch)*

- Remove the four 8 mm fixing bolts from the bottom of the windlass.
- Position the enclosed template correctly, so that the line wheel is on the correct side. Mark the position of the holes for the fixing bolts, the hole for the part of the winch that is to pass through the deck, and the opening for the rope.
- Align the winch and the roller to each other.
- Then use four of the enclosed bolts to secure the windlass firmly in position.
- Fit the windlass so that there is at least 50 cm of free height from the underside of the line wheel to the bottom of the well where the rope or chain is to lie. The area where the rope or chain is to be stored should measure at least 40 cm x 40 cm.

NB *This space is normally sufficient for 50 m x 16 mm rope or 30 m chain.*

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Maxi 32 box

NB *The Engbo line / chain box is supplied complete with predrilled holes.*

- Drill a hole for the cables and run these through the hull. Use Sikaflex or similar to seal the hole for the cables.
- Connect the cables according to the electrical connection diagram.
- When fitting the fibreglass box, the open end must be adapted to the shape of the stern and fixed in position using through-and-through bolts to connect the angle bracket supplied directly to the hull. Adjust the brackets to the correct angle and fix them internally, at the top and bottom of the side panel of the box.
- Run the rope via the line wheel on the windlass, down through the rope/chain guide and under the line wheel. Use the windlass to wind it up.

NB *The length of the box must be at least 40 cm.*

NB *Remember to secure the end of the rope/chain to the inside of the box. (Drill a hole through the bottom of the box and through the platform, and then fit the bracket supplied. Remember to drill holes in each of the lower stern corners for drainage purposes.)*

NB *The box is normally sufficient for 50 m x 16 mm rope or 30 m chain.*

Fit a standard box roller (65-00001) or tilt roller (61-30006/ 61-20007) to the angled surface on the stern end of the box. Fit the box roller with the angled side of the bracket down.

65-00001

61-30006/61-30007

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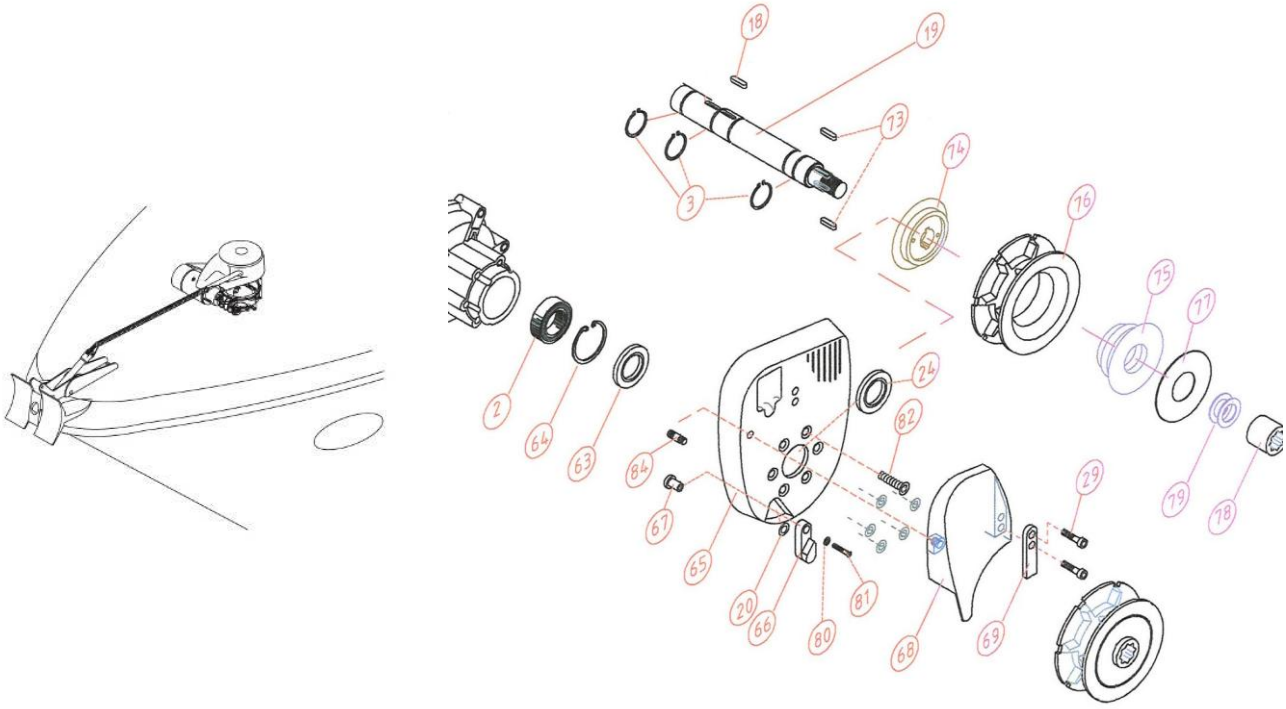
Fitting Maxi 33

The Maxi 33 is designed for horizontal installation on the fore or aft deck.

> ***NB*** *Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel.*

- Start by locating the correct position for the windlass, so that the direction of the chain is in line with the anchor bracket. Then mark the centre of the windlass.
- In most cases, it is simplest to use the windlass fixing plate (see pos. 65 on the drawing on page 27) as a template. Place the fixing plate on the boat and mark the screw holes, the centre hole for the gear, and the run-through hole for the chain.
- Remember to round off the edge of the run-through hole for the chain so that the chain does not catch on sharp edges.
- To ensure the chain does not come into conflict with the motor on the inside, the gear should be mounted so that the motor points in a different direction than the run-through hole.
- Then run the chain around the line wheel and down into the hole.

Drawing – Maxi 33 Line wheel, axle and fixing plate.



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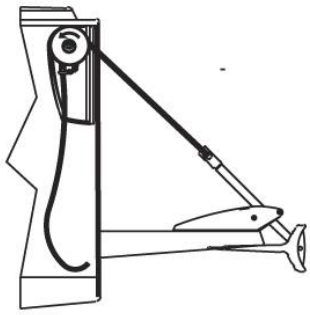
Fitting Maxi 40

The Maxi 40 is designed for fitting inside on the stern or on the bow side of a vertical bulkhead. The Maxi 40 has the line wheel on the left-hand side of the windlass, seen from behind.

***NB** Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch) The drilling template (only applies to the Maxi 40) is designed to lie on the **outside** of the hull when you mark the holes. For marking inside, you must reverse the template so that the holes in the template match the windlass.*



- Make sure that the opening in the hull for the rope is positioned correctly in relation to the direction the rope takes out through the hull. To prevent unnecessary wear, the rope should not touch the edge of the opening either vertically or horizontally. The opening should be oval (top to bottom) to accommodate the vertical play in the rope when the windlass is used.
- Position the template correctly, so that the line wheel is on the correct side. Mark the position of the opening for the rope and then drill the hole.

***NB** Make sure to position the windlass correctly in relation to the rope and anchor bracket so that the windlass line wheel and the roller are in line.*

- Once you have made the opening for the rope in the stern, you can install the windlass.
- Use a clamp or similar to fit the anchor bracket temporarily to the outside of the boat.
- Run the anchor rope tightly between the external anchor bracket and the track of the windlass line wheel.
- Hold the windlass in place inside the boat and adjust the position so that the rope is led correctly through the opening in the stern. Once you have found the correct position, mark around the windlass fixing plate before removing the windlass.
- Place the drilling template so that it matches the mark you drew on the stern, and mark the holes for the fixing bolts. Use a 9 mm bit to drill the holes, and then fit the windlass.

Example of a Maxi 40 fitted to a sailing boat

***NB** If you are to use a rope conduit with guide pulleys (68-00008), you can use the internal frame of the conduit as the template for the opening.*

- If necessary, use an intermediate panel between the windlass and the hull to adjust the windlass in relation to the direction of pull on the rope. After final adjustment of the windlass position, tighten the bolts.
- Run the rope via the line wheel on the windlass, down through the rope/chain guide and under the line wheel. Use the windlass to wind it up.

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Fitting Maxi 34-V

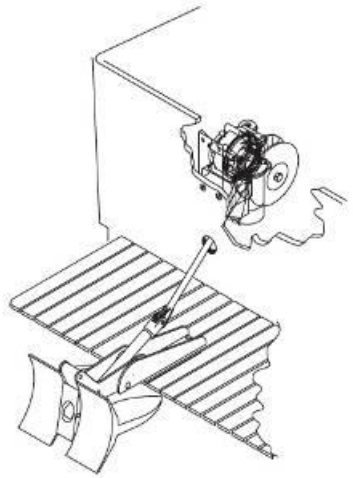
The Maxi 34-V for vertical installation on a bulkhead is an alternative to the Maxi 40 for situations in which it is best to have the line wheel on the SB side of the windlass. The Maxi 34-V is available with the line wheel on the right or left-hand side of the windlass, as seen from the rear. In principle, the Maxi 34-V is fitted in the same way as the Maxi 40.

NB *Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch)*

- It is important that the opening in the hull for the rope is positioned correctly in relation to the direction the rope takes out through the hull. To prevent unnecessary wear, the rope should not touch the edge of the opening either vertically or horizontally. The opening should be oval (top to bottom) to accommodate the vertical play in the rope when the windlass is used.

  NB *If you are to use a rope conduit with guide pulleys (68-00008), you can use the internal frame of the conduit as the template for the opening.*

- Make sure to position the windlass correctly in relation to the anchor bracket so that the windlass line wheel and the anchor roller are in line.



- Once you have made the opening for the rope in the stern, you can install the windlass.
- Use a clamp or similar to fit the anchor bracket temporarily to the outside of the boat.
- Run the anchor rope tightly between the external anchor bracket and the track of the windlass line wheel.
- Use the windlass fixing bracket as the template to mark the fixing holes.
- Hold the windlass in place inside the boat and adjust the position so that the rope is led correctly through the hole in the stern. Once you have found the correct position, mark around the windlass fixing plate and the hole in same before removing the windlass.
- If necessary, use an intermediate panel between the windlass and the hull to adjust the windlass in relation to the direction of pull on the rope. After final adjustment of the windlass position, tighten the bolts.
- Run the rope via the line wheel on the windlass, down through the rope/chain guide and under the line wheel. Use the windlass to wind it up.

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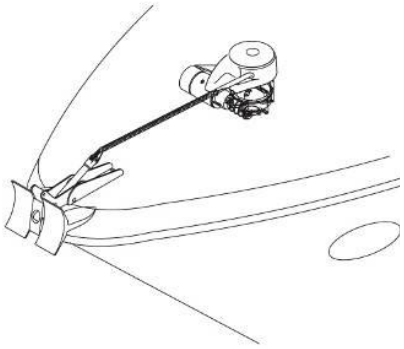
Fitting Maxi 34-D

The Maxi 34-D is designed for horizontal installation on the fore or aft deck.

NB *Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch)*

- Start by locating the correct position for the windlass, so that the direction of the rope is in line with the anchor bracket. Then mark the centre of the windlass.

- In most cases, it is simplest to use the windlass fixing plate (see pos. 49 on the drawing on page 31) as a template. Remove the white plastic cover and remove the gypsies, rope guides and spring so that the fixing plate is "clean". Remove the six screws that hold the fixing plate to the gear.



- Place the fixing plate on the boat and mark the screw holes, the centre hole for the gear, the hole for the auto stop switch (on the front port side edge of the fixing plate), and the run-through hole for the rope.

- The simplest way to position the run-through hole for the rope is to drill the fitting holes for the fixing plate and then use a couple of screws to fasten this plate temporarily to the boat. Put the plastic cover on and mark the forward edge of the cover on the contact surface. Use an appropriate hole-cutter and make sure that the cover overlaps the outer edge of the hole by around 5 mm.

- Then make the holes with an appropriate drill and hole-cutter. Remember to sand the upper aft edge and the lower fore edge of the run-through hole for the rope, to prevent the rope from catching on sharp edges.

Example of an installation of MAXI 34D into Joda 370

- Then screw the fixing plate firmly in place on the boat. Remember to draw the auto stop switch from the front port side hole of the fixing plate before screwing the gear firmly in place. To prevent the rope becoming entangled with the motor on the inside of the boat, fit the gear so that the motor is pointing directly forward, facing the port or starboard side.

- Then fit the anchor bracket and check that the anchor seats correctly on the rollers.

- Fit the gypsies and covers, the rope guard, the rope guide and the spring. Then fit the auto stop switch in the hole in the rope guard and adjust it so that the sensor face protrudes approx. 1 mm towards the rope.

- Then pull the rope through the hole in the cover, run it between the line wheel and the rope guide and down below the deck. Finally, fasten the cover in place.

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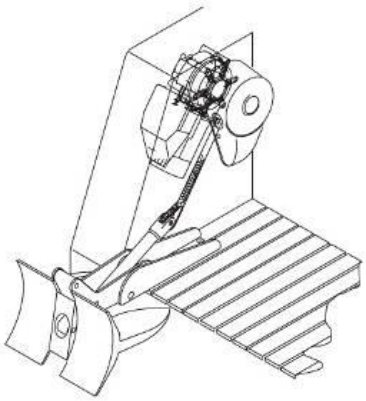
Fitting Maxi 34-G

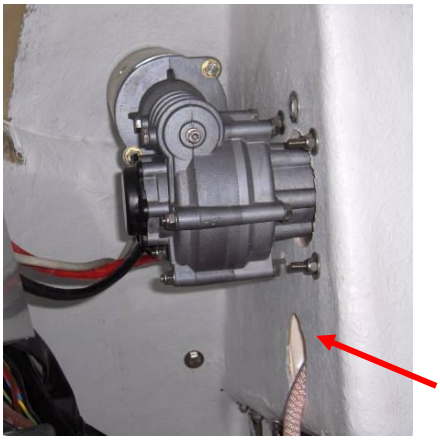
The Maxi 34-G is designed for fitting vertically on a longitudinal bulkhead with the line wheel outside and the windlass itself inside. The Maxi 34-G is available with the line wheel on the right or left-hand side of the windlass, as seen from the rear.

***NB** Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch)*



- Place the enclosed template on the surface where the winch is to be fitted – ideally as high up as possible – and mark the drilling holes.

- Alternatively, you can use the windlass fixing plate (See the drawing on page 30, pos. 49) as a template. If you choose to do so, remove the white plastic cover and take off the gypsies and spring so that the fixing plate is free of fitted parts. Remove the six screws that hold the fixing plate to the gear.



- Place the fixing plate on the surface where the windlass is to be fitted and mark the screw holes, the centre hole for the gear, the hole for the auto stop switch (on the lower stern side edge of the fixing plate), and the run-through hole for the rope. The simplest way to position the run-through hole for the rope is to drill the fitting holes for the fixing plate and then use a couple of screws to fasten this plate temporarily to the boat. Position the plastic cover, make sure that the cover overlaps the hole by approx. 5 mm at the bottom, and then mark the lower edge of the cover on the fitting surface. Then make the holes with an appropriate drill and hole-cutter. Remember to round off the outside upper edge and the inside lower fore edge of the run-through hole to prevent the rope from catching on sharp edges.

- Then fasten the fixing plate to the boat. Remember to draw the auto stop switch from the lower stern side hole of the fixing plate before fitting the gear. To prevent the rope becoming entangled with the motor on the inside of the boat, fit the gear so that the motor is pointing directly forward, facing slightly up or slightly down.

- Then fit the anchor bracket and check that the anchor seats correctly on the rollers.

- Fit the gypsies and covers, the rope guard, the rope guide and the spring (pos 52, 54 and 58, page 31). Then fit the auto stop switch in the hole in the rope guard and adjust it so that the reciprocal part sticks approx. 1 mm out from the outside of the bracket, towards the rope.

- Then pull the rope through the hole in the cover and run it between the line wheel and the rope guide.

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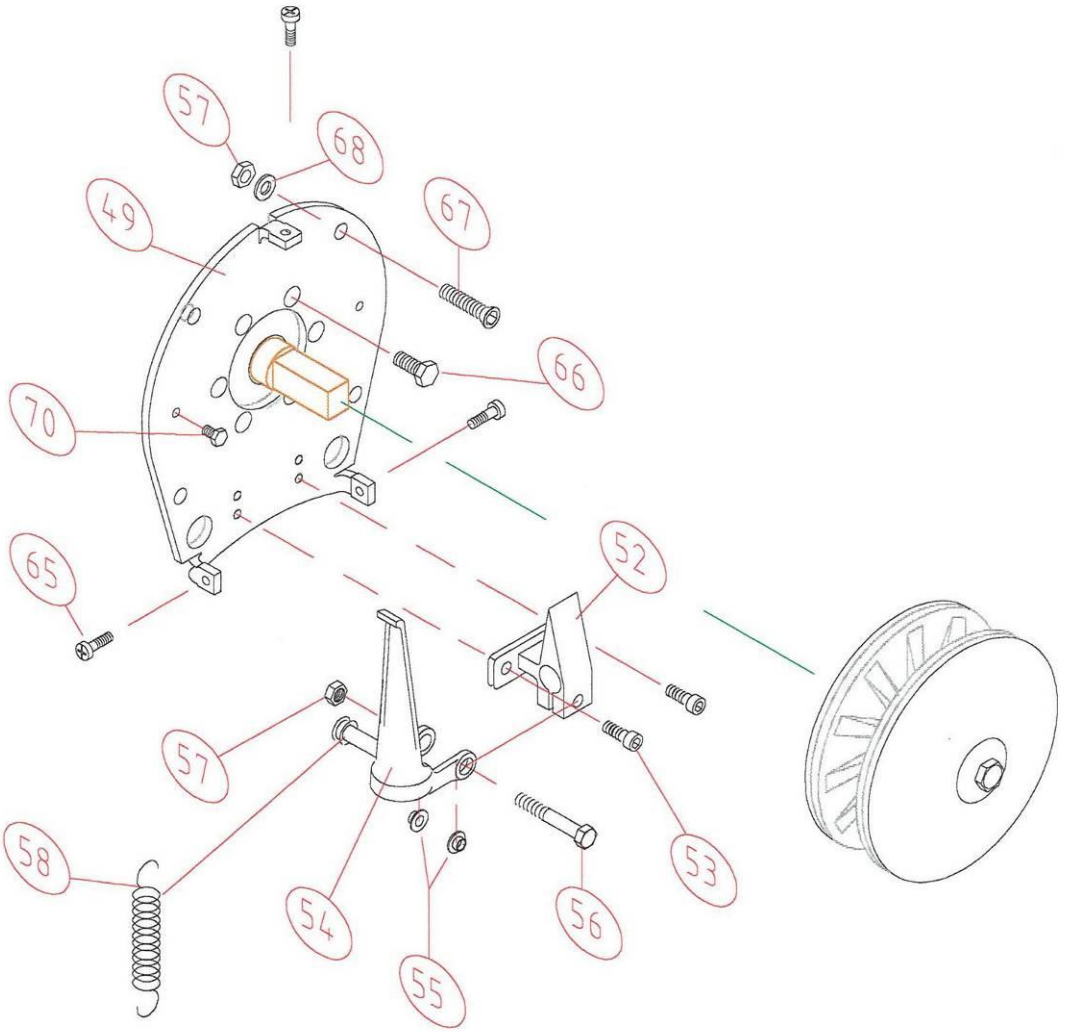
Example of a Maxi 34-4G fitted to a Grandezza 31.

- Put the white plastic cover in position. Mark the run-through hole for the rope in the cover. Make an oval hole – approx. 40 mm vertical and 20 mm horizontal – in the cover. (for instance, cut 2 holes in towards each other with a 20 mm hole-cutter. Then remove the material between the holes.)

Drawing - Maxi 34-G – line wheel, rope guide, rope guard and fixing plate

NB *The bolt (pos 17 page 39) that attaches the line wheel to the axle must be secured with contact adhesive (e.g. Locktite or similar). Recommened torque for bolts, 20Nm.*



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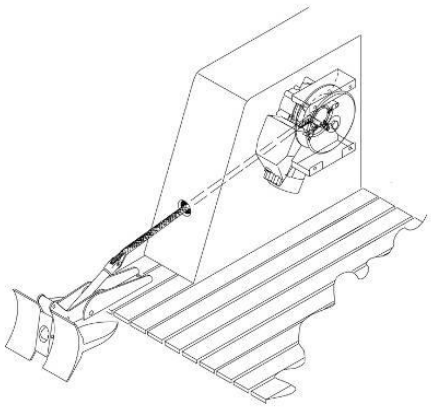
Fitting Maxi 34-S

The Maxi 34-S is intended for vertical installation on a vertical longitudinal bulkhead. It is an alternative to the Maxi 34-G if you prefer to fit the entire windlass unit inside your boat. The Maxi 34-S is available with the line wheel on the right or left-hand side of the windlass, as seen from the rear.
The windlass bracket is fitted to the bulkhead and the rope is led out via a rope conduit.

NB *Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch)*

- Make sure that the opening to lead the rope through the hull is positioned correctly in relation to the direction of the rope. To prevent unnecessary wear, the rope should not touch the edge of the opening either vertically or horizontally. The opening should be oval (top to bottom) to accommodate the play in the rope roller when the windlass is used.



NB *Make sure to position the windlass correctly in relation to the rope roller so that the windlass line wheel and the roller are in line.*

- Once you have made the opening for the rope in the stern, you can install the windlass. Run the anchor rope tightly between the rope roller on the bathing platform and the track in the line wheel. Hold the windlass in position inside. This makes it easier to establish where the windlass is to be placed to ensure that the rope sits correctly in the opening in the stern. Once you have found the correct position, mark it in accordance with the windlass fixing plate. Then remove the windlass and drill the required holes.
- ***NB*** *If you are to use a rope conduit with guide pulleys (68-00008), you can use the internal frame of the conduit as the template for the opening.*

- If necessary, use an intermediate panel between the windlass and the supporting surface to adjust the windlass correctly in relation to the opening in the hull. After final adjustment of the windlass position, tighten the bolts.

Run the rope via the line wheel on the windlass, down through the rope/chain guide and under the line wheel. Use the windlass to wind it up.

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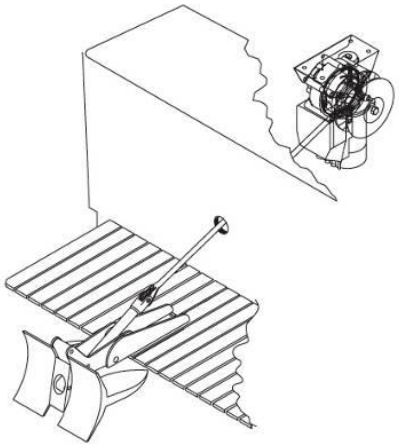
Fitting Maxi 34-H

The Maxi 34-H is designed to be fitted hanging below a horizontal surface – for example, by fitting the bracket below the deck. The Maxi 34-H is available with the line wheel on the right or left-hand side of the windlass, as seen from the rear.

NB *Make sure to fit the windlass correctly in relation to the direction of rotation of the line wheel. (See sketch)*

- Make sure that the opening to lead the rope through the hull is positioned correctly in relation to the direction of the rope. To prevent unnecessary wear, the rope should not touch the edge of the opening either vertically or horizontally. The opening should be oval (top to bottom) to accommodate the play in the rope roller when the windlass is used.

NB *Make sure to position the windlass correctly in relation to the rope roller so that the windlass line wheel and the roller are in line.*



- Once you have made the opening for the rope in the stern, you can install the windlass. Run the anchor rope tightly between the rope roller on the bathing platform and the track in the line wheel. Hold the windlass in position inside. This makes it easier to establish where the windlass is to be placed to ensure the rope sits correctly in the opening in the stern. Once you have found the correct position, mark around the windlass fixing bracket before removing the windlass. Use the fixing bracket as a drilling template. Use a 9 mm bit to drill the holes, and then fit the windlass.

NB *If you are to use a rope conduit with guide pulleys (68-00008), you can use the internal frame of the conduit as the template for the opening.*

- If necessary, use an intermediate panel between the windlass and the supporting surface to adjust the windlass correctly in relation to the opening in the hull. After final adjustment of the windlass position, tighten the bolts.

- Run the rope via the line wheel on the windlass, down through the rope/chain guide and under the line wheel. Use the windlass to wind it up.

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Fitting Maxi 38

Example of a Maxi 38 fitted to a Bavaria 29 Sport

The Maxi 38 is designed to be fitted hanging below a horizontal surface – for example, by fitting the windlass below the deck or the bathing platform, as shown in the picture to the left.
The Maxi 38 is available with the line wheel on the right or left-hand side of the windlass, as seen from the rear.

Fit, for instance, the windlass together with a "gooseneck" (68-00004), so the windlass fixing bolts are screwed into the gooseneck from below with the platform or deck in between.

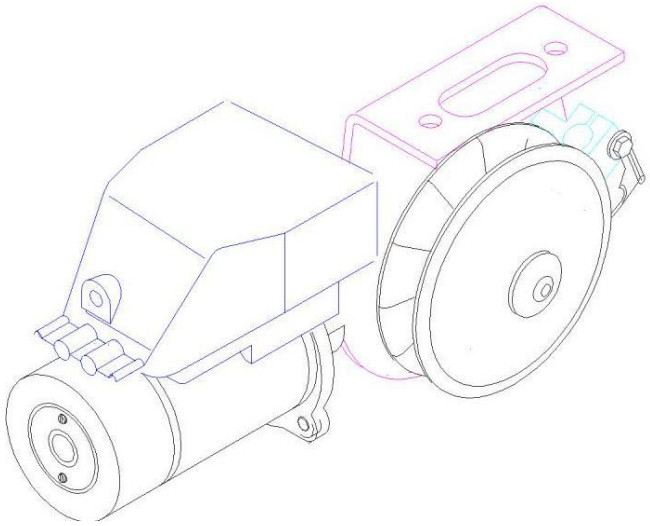
NB *Make sure to position the windlass correctly in relation to the rope roller so that the windlass line wheel and the roller are in line.*

- Use the gooseneck as the template for marking the fixing holes for the windlass.

NB *It is important to ensure that there is sufficient space between the anchor and the gooseneck, to prevent the line splice getting stuck in the gooseneck.*

- Run the line via the line wheel on the windlass, down through the rope/chain guide and under the line wheel. Use the windlass to wind it up.

- The rope is collected below the windlass. It is important to ensure that there is sufficient space to prevent the rope bunching below the windlass. There must be at least 50 cm of free space below the windlass, and the area where the rope is stored must measure at least 40 x 40 cm.



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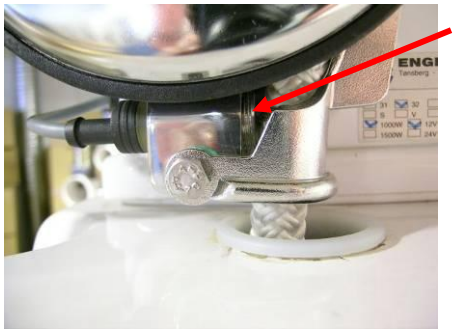
Auto stop function



All Engbo Maxi line windlasses feature an electronic auto stop function. An electronic auto stop switch is positioned below the windlass gypsy and registers the brass wire indicators attached to the rope. When the first brass wire indicator passes the sensor, the windlass will stop. If you release the button on the control panel or remote control and then press it again, the windlass will continue to reel in the anchor at low speed until the second brass wire indicator passes the sensor. The windlass will then stop again.

NB *If you wish to continue to run the windlass after the second auto stop, press the "up" button and hold it down for 10 seconds.*

Adjust the auto stop switch

- This feature is normally correctly adjusted on delivery. The flat end should usually protrude approx. 1 mm from the holder towards the rope. If you need to adjust it, loosen the bolt that holds the auto stop switch in place and adjust it to the required position. Then tighten the bolt again.

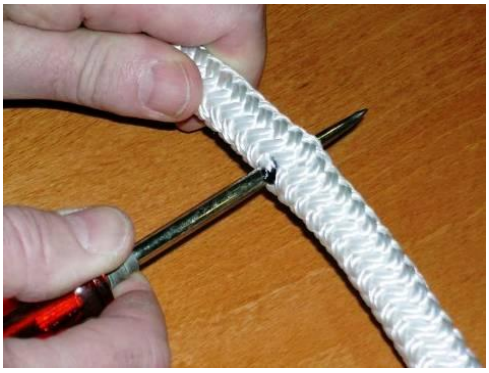
NB *Make sure that the anchor line cannot snag on the inductive sensor.*

Auto stop – fitting the stop indicator/brass wire

- An electronic auto stop switch is positioned below the rope guard. This switch triggers the auto stop function when the anchor has been raised. To activate the switch, two brass wire indicators are fitted to the rope to determine when the windlass is to stop. (Cut the enclosed brass wire in two).
- To position the brass wire indicators in the correct places on the rope, raise the anchor until the thimble is approx. 30 cm below the anchor bracket (raise the anchor slowly during the last stretch) and mark the rope right next to the auto stop switch.
- Then carefully raise the anchor completely and seat it in the bracket. Set a new mark on the rope by the sensor. Position the wire indicators by the marks (Picture 1)
- Use an appropriate tool to pierce a hole through the rope (Picture 2).
- Thread the brass wire through the rope and fold it lengthwise along the rope (Picture 3).
- Wind the free end of the brass wire five (5) times around the rope and over the other end of the wire (Pictures 4–5).
- Wind the free ends together, cut the twist down to approx. 5 mm and bend it in under the wire wrap so it cannot snag on anything (Pictures 6–9).
- The outer diameter of the wire wrap should be almost the same as the outer diameter of the rope so that the inductive sensor can detect the brass wire (Picture 10).

NB *The brass wire indicators may become worn by the gypsy – especially under heavy loads – and you must therefore check them regularly. Replace damaged wire if necessary*

1



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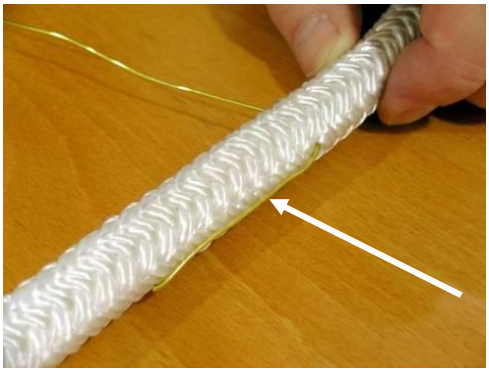

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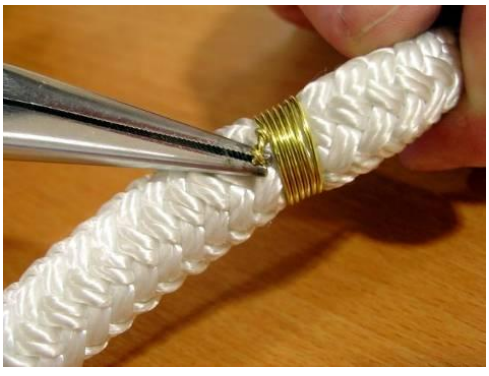

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9

10

NB *When you have used the windlass several times, the line may have stretched slightly, resulting it may be lying a little deeper in the line wheel. If the anchor does not seat firmly in the anchor bracket, you may need to post-adjust the brass wire indicator that signals the second auto stop.*

Maintenance

Replacing the batteries in the wireless remote control

The remote control uses three standard AAA/LR03 alkaline batteries. For normal operation, the batteries have a service life of more than two seasons.
To change the batteries, remove all five screws to open the remote control.

NB *The screws are different lengths and have O-rings under their heads.*

Replace the used batteries with new ones and make sure that they are installed correctly (**+** up and – down towards the bottom edge) as shown in the picture.
Replace the rear cover and carefully screw the sections together until the gasket between the sections is **gently compressed**.

The water-tightness of the remote control unit is dependent on intact O-rings and undamaged, correctly compressed packing.

NB *To ensure a long service life, the remote control unit features acid-resistant machine screws and threaded bushes in the top cover.*
Careless, excessive turning can force these screws through the top cover.
(Not covered by the warranty).

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Replacing the line wheels

If the line guide spring (see the drawing on the following page, pos. 46) is too slack, or if there is not sufficient space for the rope below the windlass, the rope can, in time, slip on the gypsy, resulting in the gypsy becoming worn. If you need to replace gypsies (pos. 14 and 15), follow the procedure described below:

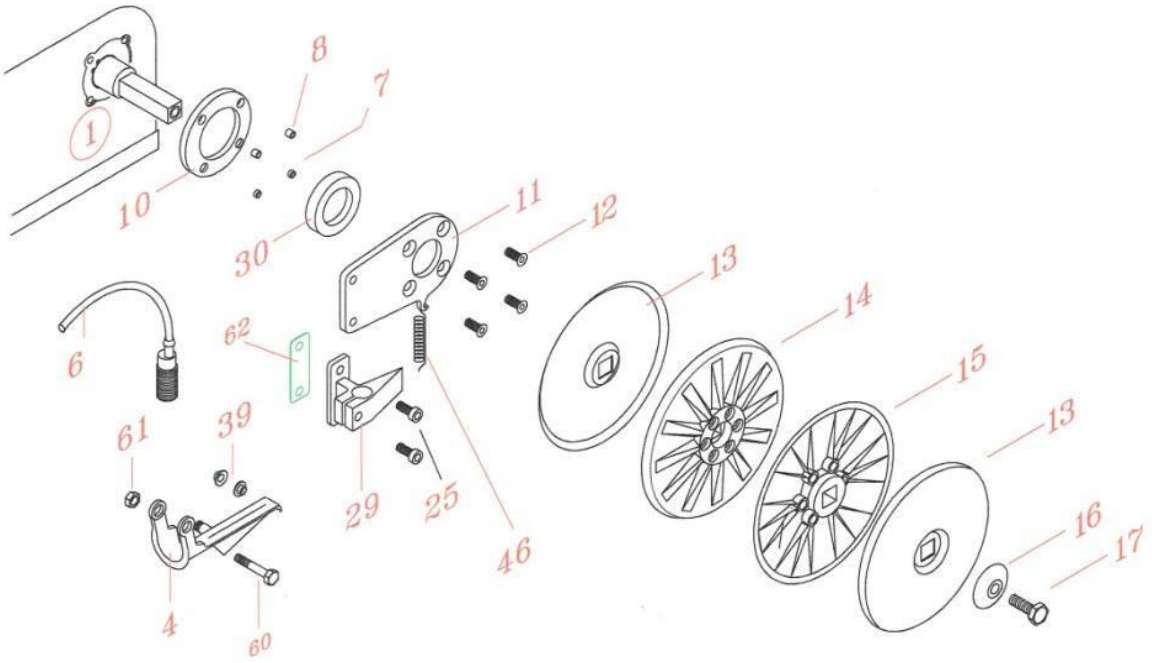
- Loosen and remove the screws and washers (16 and 17).
- Remove the outer gypsy and cover (13 and 15).
- Loosen and remove the screws (25) and the rope guard/rope guide set (29 and 4).

  NB *If necessary, remove the auto stop switch (6) by loosening the nuts (61) and pull the switch out to access the screws.*

- Remove and replace the inner line wheel.
- Reverse the process to assemble and fit the new outer gypsy.

  NB *Put contact adhesive (e.g. Locktite) on the screw (17) before tightening it.*

  NB *Recommened torque for bolts, 20Nm*



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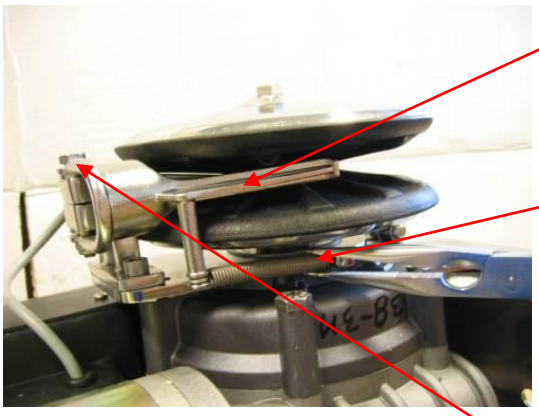
Line guide – adjusting the tension spring



The **line guide** is spring-loaded and intended to press on the rope to ensure sufficient friction between rope and gypsy. If the spring becomes over-stretched, it may be necessary to replace it. (Alternatively, **the spring** can be shortened slightly).

***NB** It is important that the line guide does not press too hard on the rope. Too much friction between the rope guide and the rope may prevent the anchor from dropping at the required speed.*

- The rope guide should be able to move easily and freely above the **hinged bolt** when the spring is not fitted. Only then will the spring be able to exert the required pressure on the rope guide.

Winter storage

- Remove the rope from the windlass before every period of winter storage. Soak it in a mild soap solution overnight. Then wash it in soapy water and rinsing fluid to rinse out all the salt residue and dirt. This will keep the rope flexible for many years. At the same time, check the wire thread auto stop indicators and replace them if necessary.
- Before winter storage, spray the windlass and all electrical points and connections with a moisture repellent spray.
- Make sure that the windlass is protected against snow and water during winter storage.
- Do not wrap the windlass, as this may cause condensation to form during winter storage.
- It is also a good idea to wash the inside of the rope box and remove seaweed, dirt, etc.

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Troubleshooting

ENGBO MAXI WINDLASSES WITH TRANSISTOR-CONTROLLED ELECTRONICS

(For connection, see the diagram in the Electrical wiring section)

	Fault symptom:	**Carry out and/or pay attention to the following:**	**The action leads to:**	**Result**
		NB You **MUST** make sure to shut off the main power supply before connecting or disconnecting cables and/or performing mechanical work.		
1.	**The windlass is completely "dead". Nothing works.**	Check that: - the main switch is in the ON position - the fuse is intact - all connection points make contact - all connections are in accordance with the diagrams in the manual - there is a sufficient voltage supply to the windlass motor. (See item 3)		
2.	**The windlass will not drop anchor and only winds in for 3 s.**	**Check that:** the connections to the electronic control unit (1, 2 and 3) are in accordance with the diagram. Swap connections 1 and 3 and the windlass should function correctly.		
3.	**The windlass does not work or pulls very poorly.**	**NB** **Experience suggests this is the most common source of error.** Check the main power supply: Measure the voltage in the battery cables where they join the windlass while the windlass is running.	For the motor to run normally, the voltage should be at least 10.5V when the windlass is operating.	**If** the voltage is lower than 10.5V, find the cause. Check all the connection points, such as the main switch, the fuse, the battery shoes, the battery voltage and, if appropriate, the general condition of the battery. **If** the voltage is above 10.5V but the motor does not work, this may be because long use/overload of the windlass has caused the electronic protection function to shut down the motor. Leave to cool down for 20 min and try again.
4.	**If the windlass does not function at all.**	Disconnect the cables from points 1, 2 and 3. -------- Strip the ends of a loose piece of cable (approx. 10 cm) and make contact between the following points: Cable between points 2 and 3 Cable between points 1 and 2	Disconnects functions normally controlled from the switch panel so that you can "force" the windlass to operate directly from the electronic unit. -------- Releases the windlass and drops the anchor. The windlass raises the anchor.	The switch panel is disconnected. -------- If the windlass operates normally when you carry out this procedure, it means that the fault is to be found in the cable to the switch panel or in the switch panel itself, which must then be replaced.
5.	**If the auto stop function does not work.** **(ONLY rope windlasses)**	**Check that:** – the connections to 4, 5 and 6 are in accordance with the diagram – the voltage to the emitter (between 4 and 6) is higher than 10 V DC. – the auto stop wires are in position. – the auto stop emitter is at the correct distance from the rope.	The indicator lamp on the emitter should light up when the metal ring on the rope is close to the sensor. (Can also be tested by putting a screwdriver, for example, near the sensor).	If the voltage is OK and the distance between the emitter and the rope is correct but the lamp does not light up, the emitter needs to be replaced.
If the windlass still does not function normally after you have carried out these procedures, the fault is in the windlass itself. Contact your dealer or Engbo AS, Tønsberg. Tel. +47 3300 3150, Fax: +47 3300 3160, E-mail: support@engbo.no				

Installation of equipment with high currents - special considerations

Preface/introduction

Engbo has experienced that over 90 % of our service-/problem enquiries, is related to power supply. This document has been made to try to address and help avoid the most common and known problems that can arise.

General

There are special considerations that must be taken into account regarding installation, use and maintenance of high current consumption equipment. It is therefore especially important that only persons with the appropriate knowledge are set to do this kind of work.

The most common products which this document applies to are electrical bow and/or stern thrusters, windlasses and electrical starters for main and/or help engines.
(Similar precautions must also be taken with generators and charging systems for batteries).

Such equipment have, or can have for shorter periods, many hundreds of ampere of current consumption.

In-rush current in an electrical motor of this kind will typically be around 2-3 times nominal current and can easily exceed 1000 A for short periods.
Currents of these sizes will generate heat in all components, including cables.

It is therefore very important that all components, including the connections of these components, are done correctly to keep the connection resistance and the total resistance in the electrical circuit as low as possible.

All connections between cable-lug and components shall **always be directly copper against copper,** (or copper against brass).
There shall never be any washers of any kind, or anything else, between the connections.

Wrong or improper use or wrong connection of such high currents components will generate a lot of heat which in worst case can cause fire.

Battery

The battery capacity must be related to the connected equipment and the use of this. For recommended size and capacity, please refer to the product specifications. Generally will a battery with higher capacity give better performance. Start-type batteries can generally give higher currents, (for a short period), than leisure/standard type and is therefore better suited for the kind of equipment mentioned above. It is important to understand the difference between battery voltage and battery capacity. An old or damaged big battery can have rest-capacity equivalent of a small motorcycle battery while it is still possible to measure a correct charging voltage of approx 14,4V DC and apparently a good no-load voltage of approx 12,8 V DC. (No-load voltage must be measured directly on the battery-posts after a couple of hours without charging from motor or land based supply.

Special "high-start-current" and similar kind of batteries are normally suited for only the smallest thruster models and windlasses as they normally have too little capacity (Ah).

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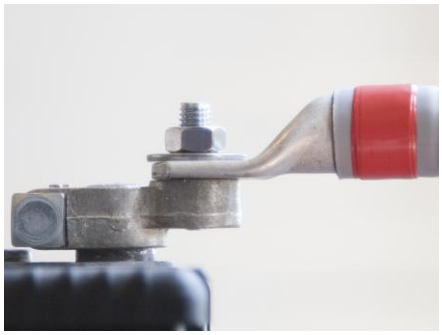
Battery-cables/lugs

Battery-cables must be related accordingly to the equipment it is connected to. Please refer to the product specifications for recommended relation between size and length. Generally speaking, a thicker cable dimension will give better performance, especially with longer cables. Use only cable-lugs of high quality. These must only be mounted on the cables with **correct tool and correct according to the procedure.**

Never use a vise, wrench or similar to press on a cable-lug. Although it may look like a good connection, over time it may become a source of ignition.

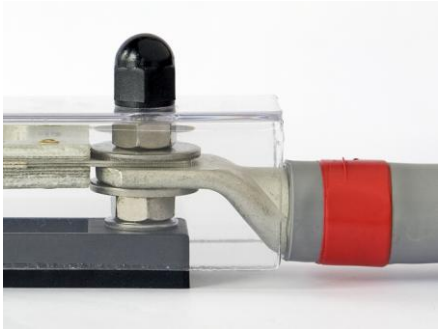
The difference between two types of cable-lugs is clearly shown in the picture. The left one illustrates a ring-type cable-lug, and is acceptable for products with currents up to ca 200A. The right cable-lug is of press-on type, and shall be used on thrusters



Battery connection

- The pictures show a correct connected battery cable. Notice that the cable-lug is mounted onto the battery post with washer and nut only on the upside of the cable-lug. **Nothing** must be placed between the battery terminal clamp and cable-lug.
- It exists different kinds of battery connections. Use only a type with bolts, and not any kind of ”spring” or ”clip-on” solutions.

- If more than one cable/cable-lug has to be mounted on the same battery-post, the one with the greatest current shall always be the lowest or closest to the battery.
- Follow the instructions for applying the correct torque on the bolts.
- After the cables have been mounted, protective and isolating rubber-cap shall be mounted.



Fuse connection

- *The bolt itself is not an active current conductor, and its only function is to assure a tight fit between the fuse and the cable-lug.*

- *The picture shows a correct connected cable to the fuse holder. Please note that fuse and cable-lug is in direct contact with a big washer **over** the fuse and **under** the cable-lug. **There must be nothing** between the fuse and the cable-lug.*

- *Correct torque for a Stainless Steel bolt (A4), is 20 Nm.*

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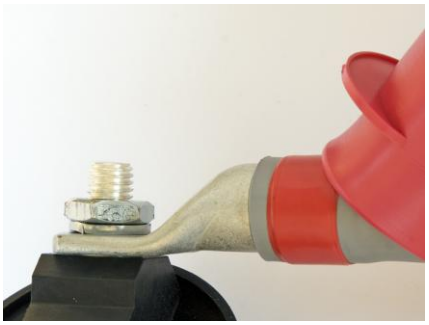
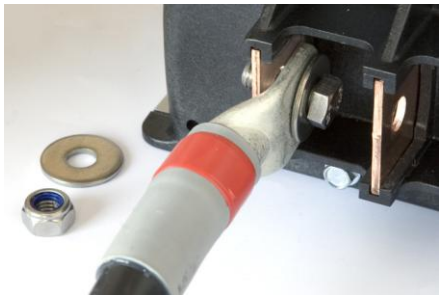


Main switch connection

- The bolt itself is an active current conductor.
- The pictures show a correct main switch connection. Please note that the cable-lug is mounted directly onto the terminal post, washer and nut is **on top** of the cable-lug.
- Different kinds of main switches with different kinds of terminals exist. Correct torque is;

  M8 Brass: 10 Nm
  M10 Brass: 15 Nm

The picture shows isolating rubber-caps mounted on both terminals. (For improved understanding, the interrupter is not mounted on a wall.)



Control box connections

Tips for mounting:

- Pre-cut correct cable-lengths and mount cable-lugs in advance so mounting the cables on the box can be done in a comfortable position before the unit is mounted in the boat.
- One will need 2 pcs 13mm spanners to secure the M8-bolts.
- A long-nosed VISE-GRIP plier may be useful to hold the nut.
- Correct torque is 20 Nm for the Stainless Steel bolts, (A4).
- Always begin the mounting/assembly from the left, entering the bolt with a big washer into the hole from the right.
- **All cable-lugs shall always be on the right side, in direct contact with the copper-bar.**
- Use M8x20mm bolts for copper-bars number; 1, 2, 3, and 5 and M8x25mm for bar number 4. It shall also be mounted a plain washer between cable-lug and lock-nut.
- Mount the three first cables with the cable-lugs pointing in same direction, as shown in the pictures.

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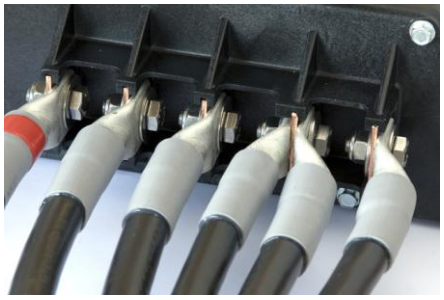
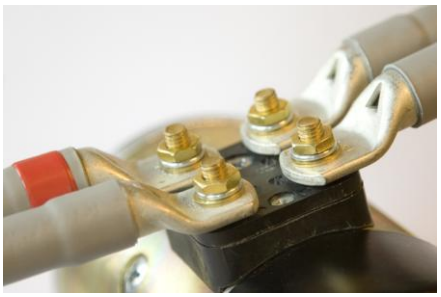


- The mounting bolts are not active current leaders and their only purpose is to assure a tight connection between the cable-lugs and bars.
- Shorter and thicker cables will give less voltage drop and thus better performance.
- Please notice how the cable-lugs on copper-bar number 4 is mounted, (turned towards each other to maximize space and ease of montage).
- Cable-lug for bar number 5 is turned the opposite direction compared with number 1, 2 og 3.
- If ever needed to dismount the cables, start from the right side and reverse the above procedure.



Motor terminal connections

- The terminal bolts are active current leaders.
- The pictures show correct connected cables on the motor terminals. Please note that cable-lug is mounted to the terminal with **brass** washers on both sides of the cable-lug, then another washer and nut on top of the cable-lug.
- Two types of terminals exist;
  Correct torque is;
  M8 Brass/copper: 10 Nm
  M10 Brass/copper: 15 Nm

- Finally, mount isolating rubber caps or plastic cap nuts. (Not shown on picture).

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